

## Wisconsin Highway Research Program

### Request for Proposals – FFY 2009

#### **Problem Title**

Evaluation of Flow Number (Fn) as a Discriminating HMA Mixture Property

#### **Background and Problem Statement**

Since the advent of WisDOT's Hot Mix Asphalt Quality Management Program in 1992 there's been much discussion pertaining to relationships between laboratory-produced mix designs, plant-produced mixtures, and acceptable production tolerances, coupled with expectations for ensuing pavement performance (whether it be exemplary or poor).

In conjunction with Wisconsin efforts to move forward with their commitment to Mechanistic Design theory, and in order to build on recently completed and on-going WHRP research, there exists an opportunity to study these relationships to enhance WisDOT's HMA mix design system and acceptance program, which is currently based on materials volumetrics. This project is to focus on flow number and mixture flow characteristics as discriminating mixture parameters.

A recently completed WHRP report (# 0092-04-07: Testing Wisconsin Asphalt Mixtures for the AASHTO 2002 Mechanistic Design Procedure) indicated the possibility that some lower ESAL level mixtures (as designed with Wisconsin procedures and materials) contain higher strength and rut resistance than other asphaltic mixtures designed to criteria intended to carry heavier loads. And, while current work with dynamic modulus ( $E^*$ ) will begin to tell us about the strength characteristics of WisDOT asphaltic mixtures, the flow number proved to be more consistently sensitive in paralleling rut resistance test results.

In addition, current field production tolerances allow alterations to JMF targets that are acceptable to volumetric evaluation but may indiscriminately alter mechanical properties affecting expected performance and pavement service life.

Without continued evaluation of mechanistic properties the department may not realize a more efficient system for use and payment of materials, creating an economic disadvantage and potential for increased product risk as it relates to ultimate pavement performance.

#### **Scope of Work/Objectives**

This research project will involve use of equipment capable of determining mixture Fn and flow characteristics and *is expected to be performed within an AASHTO Accredited Laboratory facility and/or by certified technicians..* Proposing agencies that do not carry AASHTO accreditation should clearly indicate how they intend to ensure the validity of their test results. This research will also involve, but not be limited to, the following tasks:

1. Literature review of relevant topics. Report review of WHRP 0092-04-07 and WisDOT standards used for developing the JMF and governing subsequent field production.

2. Develop materials research plan and obtain necessary materials for specimen preparation.
3. Determine the Flow Number and flow characteristics for each JMF variation.
4. Laboratory testing and data analysis.
5. Interim report
6. Identify Fn relationships related to specific materials variations and define sensitivity of Fn in ranking mixtures (tied to field performance).
7. Develop guidance to impact current WisDOT HMA Quality Management Program activities. Include any recommendations for equipment modifications or purchase.
8. Develop training tools to generate efficient use of research results.

#### **Specific Results, Findings Tools, etc. (Deliverables)**

Project deliverables include:

1. Mechanistic evaluation (Table) of key factors influencing mixture flow characteristics and Fn Values.
2. Guidance document defining improved procedures related to asphaltic mix design requirements and field production criteria/acceptance parameters (to impact the department's Construction and Materials Manual, and Standard Specifications).
3. Training tools to enhance technology transfer (ex: executive summary with key graphics, power point presentation, etc.)
4. 40 printed copies of the final Analysis report to be distributed to WisDOT (34) and WHP (6), as well as one electronic copy of the final version of the report.

#### **Length of Research and Approximate Cost to Complete**

It is anticipated that this research will be completed in 27 months for a cost of approximately \$125k. The project time frame is based on an October 1, 2008 start date with a final completion date of December 31, 2010. Additionally, the draft final report, inclusive of closeout presentation to the Technical Oversight Committee (TOC), is due no later than September 30, 2010.

This study is not heavily dependent on the construction season and can be performed throughout the anticipated project length. Time and cost estimates supplied in the research proposals will be evaluated by the TOC as part of the selection criteria.

#### **Urgency, Potential Benefit and Impacts**

In order to take full advantage of multiple research studies being completed in Wisconsin, it's felt this project will allow the department and industry to identify successful asphaltic mixtures and aggregate structures in a way to better understand production changes and impacts to original laboratory produced mix design targets as they relate to performance.

In moving ahead with mechanistic design methodologies the resultant project recommendations will offer confidence for any/all specifying agencies to step into the new methodology with a potential to further limit risk to the product for the taxpayers.

This project also offers opportunity for the successful proposer to involve academia and industry, utilizing the shared expertise of both, to advise on proposed specification changes addressing any under or over designing of product, resulting in a more efficient and economic system of engineering materials for their proper use.